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10/823,347	04/12/2004	Soo Young Choi	APPM/8657/DISPLAY/AKT/RKK	4736

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HOUSTON, TX 77056

EXAMINER

CHANDRA, SATISH

ART UNIT	PAPER NUMBER
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1763

MAIL DATE	DELIVERY MODE
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09/26/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/823,347

Applicant(s)

CHOI ET AL.

Examiner

Satish Chandra

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 September 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 80 is/are pending in the application.
- 4a) Of the above claim(s) 49 - 80 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 - 48 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 8/04, 1/06.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-48, drawn to a plate assembly apparatus, classified in class 118, subclass 715.
- II. Claims 49-80, drawn to a method, classified in class 427, subclass 569.

The inventions are distinct, each from the other because of the following reasons:

Inventions in groups I and II are related as apparatus and product made. The inventions in this relationship are distinct if either or both of the following can be shown: (1) that the apparatus as claimed is not an obvious apparatus for making the product and the apparatus can be used for making a materially different product or (2) that the product as claimed can be made by another and materially different apparatus (MPEP § 806.05(g)). In this case the apparatus can be used in another and materially different process such as etching or cleaning a reaction chamber.

Restriction for examination purposes as indicated is proper because all these inventions listed in this action are independent or distinct for the reasons given above and there would be a serious search and examination burden if restriction were not required because one or more of the following reasons apply:

- (a) the inventions have acquired a separate status in the art in view of their different classification;
- (b) the inventions have acquired a separate status in the art due to their recognized divergent subject matter;

Art Unit: 1763

(c) the inventions require a different field of search (for example, searching different classes/subclasses or electronic resources, or employing different search queries);

(d) the prior art applicable to one invention would not likely be applicable to another invention;

(e) the inventions are likely to raise different non-prior art issues under 35 U.S.C. 101 and/or 35 U.S.C. 112, first paragraph.

Applicant is advised that the reply to this requirement to be complete must include (i) an election of a invention to be examined even though the requirement may be traversed (37 CFR 1.143) and (ii) identification of the claims encompassing the elected invention.

The election of an invention may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable on the elected invention.

If claims are added after the election, applicant must indicate which of these claims are readable upon the elected invention.

Should applicant traverse on the ground that the inventions are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

During a telephone conversation with B. Todd Patterson on 10 September, 2007 a provisional election was made without traverse to prosecute the invention of the apparatus, claims 1-48. Affirmation of this election must be made by applicant in replying to this Office action. Claims 49-80 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent

Art Unit: 1763

granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 1, 3, 4, 6, 10 is rejected under 35 U.S.C. 102(b) as being anticipated by Kuthi et al (US 6,106,663).

Kuthi et al discloses:

Regarding claims 1 and 10, A gas distribution plate assembly for a plasma processing chamber, comprising: a diffuser plate 200 (Fig 2A, Column 5, lines 51 – 67)) of thickness 1 inch (Column 6, line 3 – 5) having an upstream side and a downstream side; and a plurality of gas passages 202b (Figs 2a, 2b and 2c, 2d) passing between the upstream and downstream sides, wherein at least one of the gas passages has a right cylindrical shape for a portion of its length extending from the upstream side and a coaxial conical shape for the remaining length of the diffuser plate (Fig 2C), the upstream end of the conical portion having substantially the same diameter D2 as the cylindrical portion and the downstream end of the conical portion having a larger diameter D3 (Fig 2C, 2D).

Regarding claim 3, the diameter of each of the electrode opening 202b is set to be about 0.25 inches (Column 6, lines 16 – 17).

Regarding claim 4, the opening 202b has an angled (about 30 degrees) surface 246 (Fig 2C) i.e. the conical shape is flared at about 30 degrees.

Regarding claim 6, the spacing 203 between the downstream end of the conical portion of adjacent gas passages is about 0.375 inches (Fig 2B, Column 6, lines 14, 15).

Claim 23 is rejected under 35 U.S.C. 102(e) as being anticipated by Hamelin et al (US 2006/0134919).

Hamelin et al disclose:

A distribution plate 430 (Fig 9B) comprising: a plurality of gas passages 446 passing between the upstream and downstream sides, wherein at least one of the gas passages has a first right cylindrical shape for a portion of its length extending from the upstream side, a second coaxial cylindrical shape with a smaller diameter connected to the first cylindrical shape, a coaxial conical shape 444 connected to the second cylindrical shape for the remaining length of the diffuser plate, with the upstream end of the conical portion having substantially the same diameter as the second cylindrical shape and the downstream end of the conical portion having a larger diameter

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuthi et al (US 6,106,663) in view of White et al (US 2003/0066607).

Kuthi et al were discussed above.

Kuthi et al do not disclose: the diffuser plate is either polygonal or rectangular.

White et al disclose: a rectangular gas distribution plate 20 for distribution process gas in the chamber (Para 0040).

Art Unit: 1763

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a rectangular distribution plate for distribution process gas in the chamber in the apparatus of Kuthi et al as taught by White et al.

It would also have been obvious to one of ordinary skill in the art at the time the invention was made to provide a rectangular distribution plate for distribution process gas in the chamber in the apparatus of Kuthi et al

The motivation for providing a rectangular distribution plate is provide a distribution plate of suitable geometry for gas distribution in the apparatus of Kuthi et al as taught by White et al.

The motivation for providing a polygonal distribution plate is again to provide a distribution plate of suitable geometry for gas distribution in the apparatus of Kuthi et al, which is an alternate and equivalent distribution plate.

Claims 2, 5, 9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuthi et al (US 6,106,663).

Kuthi et al disclose:

Regarding claim 2, the diameter D2 (240) of the cylindrical shape is 0.1 mm (0.003", Fig 1, Column 6, lines 26 – 28).

Regarding claim 5, the depth D4 (244) of the electrode opening 202b is preferably set to be about 1/8 inches (Column 6, lines 22 – 27).

Kuthi et al does not disclose:

Regarding claim 2, the diameter of the cylindrical shape is between about 0.03 inch to about 0.07 inch.

Regarding claim 5, the ratio of the length of the cylindrical shape to length of the conical shape is between about 0.8 to about 2.0.

Regarding claim 9, the cylindrical shape formed through the diffuser plate have a flow restricting attribute different than the coaxial flared shape.

Regarding claim 11, the gas diffuser plate size is at least 1080 inch².

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide specific sizes of the cylindrical shape holes and the diffuser plate in the apparatus of Kuthi et al.

It would also have been obvious to one of ordinary skill in the art at the time the invention was made to have a flow restricting attribute in the cylindrical hole different from the coaxial flared shape opening in the apparatus of Kuthi et al.

The motivation for providing specific size of the diffuser plate and the holes is to optimize the size of the diffuser plate and the holes in the apparatus of Kuthi et al. Furthermore, it was held where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. In Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984) and It was also held in *re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966) that the shape was a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular shape was significant. (Also see MPEP 2144.04(d)).

Art Unit: 1763

The motivation for providing a flow restricting attribute in the cylindrical opening different from the coaxial flared shape opening because of having a smaller diameter of the cylindrical hole compared to the diameter in the flared opening in the apparatus of Kuthi et al is to provide an optimal pressure difference across the distribution plate for uniform gas flow distribution.

Claims 12 - 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuthi et al (US 6,106,663) in view of White et al (US 2003/0066607) and further in view of Chinn et al (US 2003/0124848).

Kuthi et al and White et al were discussed above.

Kuthi et al and White et al do not disclose: plasma process chamber coupled to a remote plasma source and the remote plasma source is coupled to a fluorine source.

Chinn et al disclose:

A fluorine source (NF₃) coupled to a remote plasma generator 710 (Fig 7, Para 0037) which is coupled to the processing chamber 724.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a remote plasma generator coupled to a fluorine source and to the processing chamber in the apparatus of Kuthi et al and White et al.

The motivation for providing a remote plasma generator coupled to a fluorine source and to the processing chamber in the apparatus of Kuthi et al and White et al is to provide fluorine radicals for etching and cleaning purposes.

Art Unit: 1763

Claims 23 – 31, 33 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Metzner et al (US 6,454,860).

Metzner et al disclose:

Regarding claim 23, a processing system 100 (Fig 2) having a processing chamber 200 comprising a diffuser plate 240 (showerhead, Fig 4, Column 10, lines 60 – 67) having an upstream side and a downstream side; and a plurality of gas passages 238 passing between the upstream and downstream sides, wherein at least one of the gas passages (Fig 9) has a first right cylindrical shape 269 for a portion of its length extending from the upstream side, a second coaxial cylindrical shape 286 with a smaller diameter 287 connected to the first cylindrical shape, a coaxial conical shape connected to the second cylindrical shape for the remaining length of the diffuser plate, with the upstream end of the conical portion having substantially the same diameter 287 as the second cylindrical shape and the downstream end of the conical portion having a larger diameter 288.

Regarding claim 24, the diameter of the first cylindrical shape 247 is 0.11 inch (Fig 9, Col 11, line 6).

Regarding claim 25, the diameter of the second cylindrical shape 286 is 0.08 inch (Fig 9, Col 11, line 17).

Regarding claim 27, the diameter of the downstream end 288 of the conical portion is 0.213 inch (Column 11, line 55).

Regarding claim 29, the ratio of the length (0.028 inch) of the second cylindrical shape 286 (Fig 9) to the length 255 (0.1021 inch) of the conical shape is between 0.8 to about 2.0 (Columns 11 and 12).

Regarding claim 30, the spacing 261 (Fig 9) between the downstream end of the conical portion of adjacent gas passages is 0.005 inch (Column 13, lines 2- 4).

Regarding claim 31, the thickness of the diffuser plate is 0.4 inch (Column 12, line 14).

Metzner et al do not disclose:

Regarding claim 23, the coaxial conical shape connected to the second cylindrical shape for the remaining length of the diffuser plate.

Regarding claim 26, the ratio of the length of the first right cylindrical shape to the length of the second cylindrical shape is between about 0.3 to about 1.5.

Regarding claim 28, the conical shape is flared at about 20 degrees to about 35 degrees.

Regarding claim 33, the cylindrical shape formed through the diffuser plate have a flow restricting attribute different than the coaxial flared shape.

Regarding claim 35, the gas diffuser plate size is at least 1080 inch².

The angle, aperture length ratios and their diameters and size of the diffuser plate in a processing chamber are the obvious design limitations. One of ordinary skill in the art would be able to optimize the angle, aperture length ratios and aperture diameters. Furthermore, it was held where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device and a device

Art Unit: 1763

having the claimed relative dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. In Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984) and It was also held in *re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966) that the shape was a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular shape was significant. (Also see MPEP 2144.04(d)).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the angle, aperture length ratios, aperture diameters and the size of the distributor plate in the apparatus of Metzner et al.

It would also have been obvious to one of ordinary skill in the art at the time the invention was made to have a flow restricting attribute in the cylindrical hole different from the coaxial flared shape opening in the apparatus of Metzner et al.

The motivation for providing a flow restricting attribute in the cylindrical opening different from the coaxial flared shape opening because of having a smaller diameter of the cylindrical hole compared to the diameter in the flared opening in the apparatus of Metzner et al is to provide an optimal pressure difference across the distribution plate for uniform gas flow distribution.

Claims 32 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Metzner et al (US 6,454,860) in view of White et al (US 2003/0066607).

Metzner et al were discussed above.

Metzner et al do not disclose: the diffuser plate is either polygonal or rectangular.

White et al disclose: a rectangular gas distribution plate 20 for distribution process gas in the chamber (Para 0040).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a rectangular distribution plate for distribution process gas in the chamber in the apparatus of Metzner et al as taught by White et al.

It would also have been obvious to one of ordinary skill in the art at the time the invention was made to provide a rectangular distribution plate for distribution process gas in the chamber in the apparatus of Metzner et al

The motivation for providing a rectangular distribution plate is provide a distribution plate of suitable geometry for gas distribution in the apparatus of Metzner et al as taught by White et al.

The motivation for providing a polygonal distribution plate is again to provide a distribution plate of suitable geometry for gas distribution in the apparatus of Metzner et al which is an alternate and equivalent distribution plate.

Claims 36 - 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Metzner et al (US 6,454,860) in view of White et al (US 2003/0066607) as discussed in claims 23 – 35 above and further in view of Chinn et al (US 2003/0124848).

Metzner et al and White et al were discussed above.

Metzner et al further discussed coupling a remote plasma generator 400 (Fig 2) to the process chamber (Column 7, lines 7 – 15).

Metzner et al and White et al do not disclose: the remote plasma source is coupled to a fluorine source.

Chinn et al disclose:

A fluorine source (NF₃) coupled to a remote plasma generator 710 (Fig 7, Para 0037) which is coupled to the processing chamber 724.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a fluorine source connected to the remote plasma source in the apparatus of Metzner et al and White et al.

The motivation for providing a fluorine source connected to the remote plasma source in the apparatus of Metzner et al and White et al is to provide fluorine radicals for etching and cleaning purposes.

Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hamelin et al (US 2006/0134919) in view of Chinn et al (US 2003/0124848).

Hamelin et al were discussed above.

Hamelin et al do not disclose: plasma process chamber coupled to a remote plasma source and the remote plasma source is coupled to a fluorine source.

Chinn et al disclose:

A fluorine source (NF₃) coupled to a remote plasma generator 710 (Fig 7, Para 0037) which is coupled to the processing chamber 724.

Art Unit: 1763

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a remote plasma generator coupled to a fluorine source and to the processing chamber in the apparatus of Hamelin et al.

The motivation for providing a remote plasma generator coupled to a fluorine source and to the processing chamber in the apparatus of Hamelin et al is to provide fluorine radicals for etching and cleaning purposes.

Conclusion

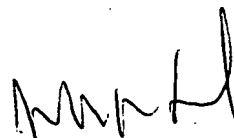
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Satish Chandra whose telephone number is 571-272-3769. The examiner can normally be reached on 8 a.m. - 4:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, Primary Examiner, Jeffrie R. Lund can be reached on 571-272-1437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Art Unit: 1763



Satish Chandra



Jeffrie R. Lund
Primary Examiner

SC

9/12/2007